

Serial No.: 10/772,181
Amendment dated December 18, 2006
Reply to Office Action dated August 17, 2006

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REMARKS

The Official Action dated August 17, 2006 has been carefully considered. Accordingly, the present Amendment is believed sufficient to place the present application in condition for allowance. Reconsideration is respectfully requested.

By the present amendment, the specification is amended to update the parent patent information and Claims 16, 20, 21 and 23 have been amended to include limitations from the specification at page 16, lines 11-15, page 24, line 15 to page 25, line 7, page 31, lines 8-13, and page 32, lines 20-23. Claims 17, 18, 22 and 23 are amended for several matters of form and clarity. Claims 31-42 are added and include limitations from the specification at pages 12, 16, 17 and 31. It is believed that these changes do not involve any introduction of new matter, whereby the entry is believed to be in order and is respectfully requested.

In the Official Action, the Examiner objected to the disclosure on the basis that the related application data had not been updated. By the present Amendment, the specification is amended to update the parent application information. It is believed that this overcomes the objection to the disclosure. Reconsideration is respectfully requested.

Claims 16-20 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner asserted that there was insufficient antecedent basis for recitation of "the cycloolefin polymer" in claims 17 and 18 and "the organic solvent" in claim 20. This rejection is traversed and reconsideration is respectfully requested. More specifically, claim 16 now recites a cycloolefin polymer, providing sufficient antecedent basis for the recitation of "the cycloolefin polymer" in claims 17 and 18. Additionally, claim 20 has been amended to recite component (c), an organic solvent, thereby providing sufficient antecedent basis for recitation of "the organic solvent." It is therefore believed that claims 16-20 are definite, whereby the rejection under 35 U.S.C. §112, second paragraph, has been overcome. Reconsideration is respectfully requested.

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Claims 16-23 were rejected under 35 U.S.C. §102(e) as being anticipated by the Kataoka et al U.S. Patent No. 5,783,639. The Examiner asserted that Kataoka et al disclose a resin composition comprising an epoxy group-containing cycloolefin resin and a cross-linking agent which is characterized by excellent heat resistance, solvent resistance, low water-absorption property, electrical insulating property, adhesion and chemical resistance and may be used as a layer insulation film for circuit boards, semiconductor devices and electronic components. The Examiner referred to the examples of Kataoka et al as forming a dry film as solvent is removed, and as forming a multilayer film, particularly in Example 16.

This rejection is traversed and reconsideration is respectfully requested. The dry films formed from a curable resin composition according to claims 16-20 exhibit excellent shelf stability, high heat resistance, low water absorption properties and excellent dielectric properties. Additionally, and importantly, the laminates and multi-layer laminates of claims 21-23, containing a dry film formed from the curable resin composition, may contain minute via holes, even in a film having a thickness as great as 20-80 μm . Kataoka et al neither teach nor suggest such dry films, laminates or multi-layer laminates as claimed, the processes of producing such, or the improvements thereof.

More particularly, as defined by claim 16, the present invention is directed to a dry film formed from a curable resin composition which comprises a cycloolefin polymer and a hardener. The cycloolefin polymer contains a polar group selected from the group consisting of a carboxyl group and a hydroxyl group, with the rate of introduction of the polar group in the cycloolefin polymer within a range of 0.1-100 mol percent, based on the total number of units in the polymer, and at least 50 mol percent of a repeating unit derived from a cycloolefin monomer. The cycloolefin polymer has a number average molecular weight within a range of 1,000 to 1,000,000 as measured by gel permeation chromatography. The hardener is selected

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from the group consisting of an organic peroxide and a hardener capable of exhibiting its effect by heat. Claim 20 is directed to a process for producing such a dry film by applying the curable resin composition as defined and further comprising an organic solvent to a substrate and removing the organic solvent under conditions that a curing reaction of the curable resin composition is not cause to completely proceed.

Claim 21 is directed to a laminate comprising an insulation layer formed with a dry film formed from the curable resin composition, and a conductive layer formed on the surface of the insulating layer. Claim 22 defines a multi-layer laminate comprising at least two laminates according to claim 21, with the insulating layer of the second laminate formed with the dry film formed on the conductive layer of the first laminate. Claim 23 recites a process for producing such a multi-layer laminate using the curable resin composition.

To appreciate the improvements provided by the dry film of claims 16 and 20, particularly in laminates and multi-layer laminates as recited in claims 21-23, the Examiner's attention is directed to the attached copy of the Declaration Under 37 CFR 1.132 of the co-inventor Tohru Hosaka filed by Certificate of Mailing on December 6, 2002 in parent application Serial No. 09/445,310. In Experiment 2 set forth at pages 2-3 of the Declaration, several thick films of 40 μm are prepared. Specifically, paragraph 2.1 indicates that, as in Example 1 of the present specification, a solution of a photosensitive resin composition containing an epoxy-modified norbornene copolymer and a photoreactive substance was coated on a substrate to form a coating film of 40 μm in thickness. Example 1 of the present specification indicates that 4,4' bisazidobenzal (4-methyl) cyclohexane is the photoreactive substance (see page 68, lines 20-24 and pages 79-80 of the specification). Via holes were formed by photolithography. Specifically, the coating film was exposed to ultraviolet light

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having light intensity of 150 mJ/cm^2 at 365 nm using a test pattern mask for formation of via holes. The exposed film was developed with cyclohexane to form via holes 50 μm in diameter.

The Declaration further indicates in Experiment 2, paragraph 2.2, that Example 4 of the specification was followed to provide a solution containing a maleic acid-modified norbornene copolymer, a crosslinking aid and an organic peroxide, the solution was coated on a substrate to form a coating film of 40 μm in thickness, and the coating film was heated at 220°C for four hours to completely cure the film. Via holes 50 μm in diameter were formed using a UV-YAG laser.

Finally, the Declaration further indicates in Experiment 2, paragraph 2.3, that Example 5 of the specification was followed to provide a solution containing a hydroxy-modified norbornene terpolymer, a crosslinking aid and an organic peroxide, the solution was coated on a substrate to form a coating film of 40 μm in thickness, and the coating film was heated at 220°C for four hours to completely cure the coating. Via holes 50 μm in diameter were formed using a carbon dioxide laser.

As described in paragraph 2.4 of the Declaration, each of the coating films with via holes was released from the substrate on which it was formed to observe the sectional shape of the via holes and measure the aspect ratio a/b , wherein a is the diameter of the via hole as measured at the surface of the coating film and b is the diameter of the via holes measured on the substrate side of the film. The smaller the aspect ratio, the better, more uniform the shape of the via hole. All via holes in the coating film formed from the epoxy-modified norbornene copolymer according to Example 1 and formed by means of photolithography exceeded 2, indicating that the sectional shapes were less than satisfactory. On the other hand, in the

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coating films according to Examples 4 and 5, containing carboxylic acid-modified cycloolefin polymer and hydroxyl-modified cycloolefin polymer, respectively, according to the present invention, the aspect ratios of all of the via holes were less than 1.5, indicating a satisfactory sectional shape. Thus, the Declaration indicates in Experiment 2 that a cured resin composition comprising a cycloolefin polymer containing a polar group selected from the group consisting of a carboxyl group and a hydroxyl group, when cured, allows laser formation of more uniformly shaped via holes in thick films as compared with a resin composition comprising an epoxy-modified cycloolefin polymer.

Thus, the Declaration of parent application Serial No. 09/445,310 demonstrates that dry films according to claim 16 may be cured and, using laser techniques, formed with uniformly shaped via holes, which is an advantageous property for laminates and multi-layer laminates containing such dry films.

Kataoka et al disclose a resin composition comprising an epoxy group-containing thermoplastic norbornene resin and a cross-linking agent, suitable for use as interlayer insulation material, and broadly disclose that their resin may be formed from norbornene type monomers including, among others, derivatives of substituted or unsubstituted norbornene type compounds substituted by a polar group such as a halogen, hydroxyl group, ester group, alkoxy group, cyano group, amide group, imide group or silyl group, etc. (column 5, lines 13-24). However, Applicants find no specific teaching or exemplary disclosure regarding a cycloolefin polymer containing a polar group selected from the group consisting of a carboxyl group and a hydroxyl group as claimed, or any suggestion regarding any improvement provided thereby.

More specifically, Kataoka et al neither teach nor suggest that a cycloolefin polymer having a carboxyl group or hydroxyl group may be combined with an organic peroxide or a

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harder capable of exhibiting its effect by heat, to obtain an interlayer insulating film in which via holes of more uniform shape may be laser-formed. To the contrary, the Declaration Under 37 CFR 1.132 demonstrates that laser formation of via holes in a film formed by photolithography from an epoxy-modified norbornene resin as taught by Kataoka et al causes via holes having unsatisfactory aspect ratios of greater than 2.

The Examples of Kataoka et al only show the formation of thin coating films having a thickness of 3.3-15 μm . Via holes having a diameter of 15-50 μm are typically formed in coating films formed of the photosensitive resin compositions of Kataoka et al using lithographic techniques. Since the thickness of the Kataoka et al coating film is 15 μm or less, via holes as fine as 15-50 μm can be formed by lithography. However, when the thickness of a coating film formed of such a photosensitive resin composition is increased to at least 20 μm , the light transmittance of the coating film is lowered and the pattern form of via holes therein deteriorates as it is difficult to form fine diameter via holes, particularly perpendicular in form, by lithography as taught by Kataoka et al. Consequently, via holes of such thicker films of at least 20 μm are typically formed using a laser, and insulating materials formed from a dry film of a curable resin composition according to the present invention are particularly suitable for via hole formation by use of a laser, allowing the formation of via holes with satisfactory aspect ratios as demonstrated in the Declaration.


Moreover, the solutions of the photosensitive resin compositions disclosed by Kataoka et al are poor in shelf stability and often exhibit changes in sensitivity during storage. The Declaration specifically discloses in Experiment 1 that the photosensitive resin compositions prepared as disclosed by Kataoka et al are poor in shelf stability.

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Anticipation under 35 U.S.C. §102 requires that each and every element as set forth in the claims is found, either expressly or inherently described, in a single prior art reference, *In re Robertson*, 49 U.S.P.Q. 2d 1949, 1950 (Fed. Cir. 1999). Further, a prior art reference must provide a specific, limited teaching relating to the claimed invention in order to anticipate the same, *In re Petering*, 133 U.S.P.Q. 275 (C.C.P.A. 1962). As Kataoka et al do not specifically teach a dry film formed from a resin composition comprising a cycloolefin polymer containing polar groups selected from the group consisting of a carboxyl and a hydroxyl group, as defined in claims 16, 20, 21 and 23, Kataoka et al do not anticipate these claims, or the claims dependent thereon, under 35 U.S.C. §102. Further, Applicants have established that dry films as presently claimed exhibit improvements over the specific teachings of Kataoka et al, which improvements are neither taught nor suggested by Kataoka et al. It is therefore submitted that the dry films, processes, laminates and multi-layer laminates defined by the present claims are not anticipated by, and are patentably distinguishable from, Kataoka et al, whereby the rejection under 35 U.S.C. §102 has been overcome. Reconsideration is respectfully requested.

It is believed that the above represents a complete response to the Official Action and places the present application in condition for allowance. Reconsideration and an early allowance are requested.

Respectfully submitted,


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